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(54) PORTABLE INFORMATION PROCESSOR WITH INPUT DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a small-size portable information processor facilitating character input and having superior usability by solving a problem of the small-size portable information processor called PDA(personal data assistant) wherein a vertical liquid crystal display is generally used for displaying information in a small-size display and when enlarging the liquid crystal display for improving visibility pitches between input keys become narrow to sacrifice the operability of the character input.

SOLUTION: An input device having key switches arranged into a matrix is rotated for stacking with a body so as to improve the portability for carrying with and protect the liquid crystal display. In using the input device is rotated and turned to long sideways so as to secure the wide key pitches and facilitate the key input. This constitution can provide the portable information processor with portability and operability.

CLAIMS

[Claim(s)]

[Claim 1] It will be in the state where said liquid crystal display is not exposed in the state where had the following rotated said input device centering on said axis of rotation and it rotated to said liquid crystal display side A portable information

processor wherein said input device rotates so that said liquid crystal display may be thoroughly exposed in the state where it rotated to an opposite direction.
It is a liquid crystal display at least.

A base unit provided with the vertical axis of rotation to said liquid crystal display.
An input device combined with said base unit via said axis of rotation more widely than an opening of said liquid crystal display.

[Claim 2] The portable information processor comprising according to claim 1:
The first holding mechanism where an angle of rotation is stabilized after said liquid crystal display has closed thoroughly.

The second holding mechanism where an angle of rotation is stabilized in the state where said input device is in a position which can be inputted while said liquid crystal display looks at said liquid crystal display in the state where it opened thoroughly.

[Claim 3] Said axis of rotation is located in the lower left side of said liquid crystal display in the portable information processor according to claim 1. A portable information processor characterized by a center line of said liquid crystal display and a center line of said input device being almost equal after an input device rotated centering on said axis of rotation and said liquid crystal display has opened.

[Claim 4] In the portable information processor according to claim 1, said input device is rotated towards said liquid crystal display being exposed. A portable information processor intercepting a power supply if it detects that will switch on a power supply if it has a detection part as which said liquid crystal display detects the state where it exposed thoroughly and said detection part detects exposure and said detection part is not exposed.

[Claim 5] In a portable information processor of claim 1, said base unit and said input device are made into airtight structure without an opening of a portion except said axis of rotation. And a portable information processor which said detection part is a magnet switch and is characterized by providing said base unit and said input device with waterproofness.

[Claim 6] A portable information processor wherein the surface of said input device communicates with an electronic circuit which is the material which is rich in pliability such as an elastomer and covered with material without a joint and was stored in said base unit by radio such as electromagnetic waves or infrared rays in the information processor according to claim 5.

[Claim 7] A switch for inputting a character, a sign, etc. into an input device -- in addition, a portable information processor given in claims 1-6 provided with pointing devices such as a flat pad and a joy stick of an XY direction.

[Claim 8] A portable information processor given in claims 1-6 equipping a front face of said liquid crystal display with a touch panel and operating specification of position information by touching a touch panel with a finger or a nib.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the portable information terminal which has a display of the vertical mold of size which can be put in and carried in general in a pocket and what is called PDA (personal digital assistance).

[0002]

[Description of the Prior Art] The apparatus which has a longwise liquid crystal display in the size of the grade into which it is put by the chest pocket called PDA (Personal Digital Assistant) also in the conventional portable information processor is spreading. In these apparatus since it cannot have a keyboard of sufficient size what performs even not only the function of a pointing device but a character input with a pen is common. However since the display portion of a small screen became still smaller [in order to perform a character input using a pen in order that the pad of a character input may occupy some screens / from the first / a personal computer] the amount of information which can be displayed at once was hard to see few. In order to solve this there were some which formed the key switch for a keystroke apart from the display portion like MI-E1 which is PDA of a sharp company for example but the technical problem that the pitch between keys tends to press simultaneously even the key which adjoins narrowly occurred.

[0003]

[Problem(s) to be Solved by the Invention] In such a portable information processor since a display is a vertical mold while a main part also serves as longwise shape an input device is wanted to be oblong shape as the key switch for a keystroke has a certain amount of key pitch. Or since the amount of information which can be simultaneously displayed since the lengthwise direction of a liquid crystal display will become short if a main part is widened according to the width of an input device decreases list nature will fall.

[0004] This invention was made in order to solve the above-mentioned technical problem portability is excellent by folding up an input device small at the time of carrying and an object of this invention is to provide the portable information processor which is excellent in the operativity of a keystroke.

[0005]

[Means for Solving the Problem] a liquid crystal display of a case in which a portable information processor of this invention serves as a base unit which stored the electronic circuits where a liquid crystal display and a cell of a vertical mold CPU (central processing unit) etc. are main in order to attain this purpose -- an input device is connected in general to the lower left side pivotable via the axis of rotation. This axis of rotation is connected as an angle variable in a central base unit and an input device. Where an input device is rotated so that it may lap with a liquid crystal display a size and shape where an input device covers an opening for exposing a liquid crystal display thoroughly are used. When carrying a portable information processor of this invention a liquid crystal display is covered with an

input device.

[0006]After a liquid crystal display portion of a base unit has been exposed it shall be stabilized in the position which is an input device and a center line of a liquid crystal display and whose center line of an input device correspond with a near side of a liquid crystal display mostly. Thereby key input operations can be performed easily holding an input device with both hands.

[0007]It becomes possible to realize waterproofness by covering a front face of a keyboard with covering of integral construction which is a raw material which is rich in pliability such as an elastomer and does not have a joint making key operation possible.

[0008]Thereby it excels in portability and a portable information processor with easy key input operations is realizable.

[0009]

[Embodiment of the Invention]At least the invention of this invention according to claim 1 A liquid crystal display The base unit provided with the vertical axis of rotation to said liquid crystal display It consists of an input device combined with said base unit via said axis of rotation more widely than the opening of said liquid crystal display It will be in the state where said liquid crystal display is not exposed in the state where rotated said input device centering on said axis of rotation and it rotated to said liquid crystal display side In the state where it rotated to the opposite direction as said liquid crystal display is thoroughly exposed it is a portable information processor wherein said input device rotates and it has the operation that a character input becomes easy with slight height about the portability at the time of storage at the time of use.

[0010]In the portable information processor according to claim 1 the invention according to claim 3 Said axis of rotation is a portable information processor characterized by the center line of said liquid crystal display and the center line of said input device being almost equal after being located in the lower left side of said liquid crystal display the input device's rotating centering on said axis of rotation and said liquid crystal display's having opened Since an input device and a liquid crystal display turn to a transverse plane at the time of use it has the operation of excelling in operativity.

[0011]In the portable information processor according to claim 1 the invention according to claim 4 Make it rotate towards said liquid crystal display exposing said input device and said liquid crystal display is provided with the detection part which detects the state where it exposed thoroughly When it detects that will switch on a power supply if said detection part detects exposure and said detection part is not exposed it is a portable information processor intercepting a power supply and in order to intercept supply of a power supply automatically at the time of disuse it has the operation of preventing losing the residue of a cell more carelessly.

[0012]In the portable information processor of claim 1 the invention according to claim 5 Said base unit and said input device are made into airtight structure without the opening of the portion except said axis of rotation And said detection part is a magnet switch it is a portable information processor wherein said base unit

and said input device are provided with waterproofness and since waterproofness is easily realizable it becomes possible to use it also in the environment which waterdrop requires like the outdoors of rainy weather.

[0013] The invention according to claim 7 is added to the switch for inputting a character a sign etc. into an input device. It is a portable information processor given in claims 1-6 provided with pointing devices such as a flat pad and a joy stick of an XY direction and has the operation that a character input and pointing operation can be performed simultaneously. Hereafter an embodiment of the invention is described using drawing 11 from drawing 1.

[0014] (Embodiment 1) Drawing 1 is a front view showing a general view of the portable information processor in the 1 embodiment of this invention and (a) is a front view at the time of rotating an input device and closing a liquid crystal display and a front view at the time of (b) rotating an input device and opening a liquid crystal display. Drawing 2 is an A-A sectional view in drawing 1 (a).

[0015] In drawing 1 an input device for 1 to input a character and a sign and 2 store the battery for operating electronic circuits such as CPU and a memory and an electronic circuit by a base unit. The liquid crystal display 3 for a display is formed in the front face of the base unit 2. The input device 1 and the base unit 2 are combined with an angle variable via the axis of rotation 4.

[0016] The switch 5 corresponding to a character or a sign is arranged at matrix form at the front face of the input device 1 and the symbol (not shown) of the character corresponding to the switch 5 or the sign is displayed on the front face of the switch 5. The input of a character or a sign is performed by touching the upper surface of the switch 5 at the points such as a finger or a pen. The arrangement of the character should apply to the arrangement (for example QWERTY arrangement) of the common keyboard correspondingly. If the switch 5 also has [touching with a finger] too narrow an interval with the adjoining switch 5 for a certain reason in order that even the switch 5 which adjoins when the switch 5 is pushed may be pushed a large interval shall be taken as much as possible. In QWERTY arrangements since there are many keys horizontally located in a line rather than length it is desirable that it is oblong shape. Therefore it is considered as oblong shape.

[0017] The base unit 2 is equipped with the liquid crystal display 3. The width of the liquid crystal display 3 makes narrow width only the part of the circuit of the liquid crystal display 3 and its largest possible thing is better than the breadth of the base unit 2. As for shape it is desirable that they are a square or a little longwise shape. Since movement of a look will become large in the portion of line feed if width on either side is wide when displaying texts such as reception mail by displaying to a lengthwise direction mostly with a longwise liquid crystal the number of characters made simultaneously increases and it becomes legible. For this reason a longwise liquid crystal shall be used in the portable information processor of this invention.

[0018] When not using a portable information processor the input device 1 is rotated centering on the axis of rotation 4 and as shown in the A-A sectional view

of drawing 2 the input device 1 covers the base unit 2. Since the input device 1 is oblong shape it is made into the shape which is in agreement with the longwise base unit 2 exactly. In this state the liquid crystal display 3 is covered by the input device 1. Since the input device 1 is in the position which protects the liquid crystal display 3 when putting in and carrying in the inside of a bag or a pocket it can prevent damaging the liquid crystal display 3 by a mechanical shock.

[0019] Next the input device 1 is rotated centering on the axis of rotation 4 and the liquid crystal display 3 is exposed. Since the axis of rotation is provided in the front left of the liquid crystal display 3 it is located in the near side of the liquid crystal display 3 and the center line of the right and left of the liquid crystal display 3 and the center line of the right and left of the input device 1 become the physical relationship which laps mostly. The state of opening the liquid crystal display 3 and performing a keystroke from the input device 1 is shown in drawing 3. When it inputs holding a portable information processor with right-and-left both hands since the liquid crystal display 3 is exactly located in a transverse plane it excels in operativity legible.

[0020] Drawing 3 shows the middle of opening and closing the input device 1 holding a portable information processor by left-hand one hand. In this embodiment since it is small it is also possible to carry out switching operation single hand as shown in a figure. And operating it looking at a screen cuts with the state where it opened as shown in drawing 4.

[0021] Adjustment of the axis of rotation 4 and angle of rotation is explained. In this invention the input device 1 can rotate 90 degrees and is used in the state of either of the states or the states where it closed thoroughly which the liquid crystal display 3 opened thoroughly. Since not less than 90 degrees of input devices 1 do not need to rotate how to regulate an angle of rotation is explained. Drawing 5 is a figure explaining the structure for regulating angle of rotation (a) is a perspective view and (b) is a sectional view for a slot. It is a hollow where 7 is located in a guide groove and 9a is located in one end of a guide groove in drawing 5 and 9b is a hollow located in the other end of a guide groove. The projection 8 which fits into the guide groove 7 is formed in the back of the input device 1.

[0022] The guide groove 7 is a 90-degree circle centering on the axis of rotation 4 and it is made for a guide groove to become shallow from the height of the projection 8. In the both ends of the guide groove 7 it becomes depressed and 9a and 9b are provided and let the depth of the hollows 9a and 9b and the height of the projection 8 be equals. Where the liquid crystal display 3 is closed with the input device 1 the projection 8 has fitted into the hollow 9b in the end of the guide groove 7. In this state in order for the tip of the projection 8 to become depressed and to fit into 9b it does not move by slight power but where the liquid crystal display 3 is closed it is stabilized. In this state about the input device 1 if power is applied to left-hand side in a figure the projection 8 will become depressed 9b is overcome and it moves in the guide groove 7. Since the height of the projection 8 is larger than the depth of the guide groove 7 at this time the input device 1 will be floated a little. If 90 degrees rotates after that the projection 8 will fit into the slot

9a located in the other end of the guide groove 7 and as for its position will be stabilized. The above composition can use it in the state or the state where it is closed which the liquid crystal display 3 opens stabilizing the input device 1.

[0023] The option which regulates angle of rotation is shown in drawing 6. Drawing 6 is a perspective view showing the circumference of the axis of rotation 4 by the side of the base unit 2. A shuttlecock-like projection is provided in the axis of rotation 4 and the angle of rotation of a shuttlecock is regulated by the cylindrical projection of two. Although the wiring (not shown) which connects the input device 1 and the electronic circuit stored in the base unit 2 passes a center or around the axis of rotation it can prevent twisting wiring by regulating the angle of rotation of the input device 1 at 90 degrees in this way.

[0024] (Embodiment 2) A second embodiment of the portable information processor of this invention is described in detail. Drawing 7 is a sectional view of the input device in a second embodiment of this invention. In drawing 7 71 is an input device and 75 is called what is called a membrane with the sheet shaped field switch which is arranged at matrix form and detects press. The exterior of the elastomer covering 76 is formed so that the upper surface of the field switch 75 may be covered. In the surface of the elastomer covering 76 of the position corresponding to each switch of the field switch 75 the symbol display (not shown) of the character or sign which shows a switch is printed. Let elastomer covering 76 be the shape around which it turns to the side or the back of not only the upper surface but the input device 71. Since it is the same as that of Embodiment 1 about the structure by the side of a base unit and the rotation method of the input device 71 explanation is omitted.

[0025] According to this embodiment since the surface of the input device 71 is covered for the raw material without a joint which was rich in pliability it can prevent permeation of water drop. Since the input device 71 covers the surface of the liquid crystal display 3 at the time of carrying and the surface of the input device 71 is covered with the elastomer covering 76 Even if it gets a mechanical shock by fall etc. a risk of the liquid crystal display 3 being damaged can decrease substantially and breakage by the handling inattention at the time of carrying can be prevented.

[0026] When the input device 71 and the base unit 2 deliver and receive data via a wireless communication unit it becomes possible to improve waterproof performance further. In this case since they approach and are used even if the input device 71 and the base unit 2 use an electric wave for radio and they use infrared rays they can be communicated with weak electric power.

[0027] (Embodiment 3) A third embodiment of this invention is described using drawing 8. In drawing 8 81 is the magnet formed in the inside of the projection 8 or the neighborhood and 82 is the electromagnetic switch formed near the hollow 9a by the side of the base unit 2. Since it is the same as Embodiment 1 about portions other than this it omits.

[0028] When the until [state full] input device 1 which the liquid crystal display 3 opened is rotated the magnet 81 and the electromagnetic switch 82 will adjoin on

both sides of the case of the input device 1 and the case of the base unit 2. Since the electromagnetic switch 82 flows by this the power supply of a portable information processor will be switched on and a portable information processor will be in a working state.

[0029] It changes into the state where rotated the input device 1 from the working state and the liquid crystal display 3 was closed. Since the magnet 81 also keeps away from the electromagnetic switch 82 in order that the height 8 may become depressed may become depressed along the guide groove 7 from 9a and may move to 9b the electromagnetic switch 82 will be in a cut off state. The power supply of a portable information processor is turned OFF in response to interception of the electromagnetic switch 82. As how to turn off the power the electric power supply to an electronic circuit may be cut and after storing the data under work in nonvolatile memory such as a flash memory with the signal of the electromagnetic switch 82 the power supply of an electronic circuit may be intercepted.

[0030] It cannot be used where the liquid crystal display 3 is closed with the input device 1 and in the state where it closed the life of a cell can be greatly developed by intercepting the power supply of an electronic circuit and saving power consumption.

[0031] (Embodiment 4) A fourth embodiment of this invention is described using drawing 9 and drawing 10. In drawing 9 91 is an input device and 92 is a joy stick. Since it is the same as that of Embodiment 1 about other composition it omits. Since the joy stick 92 is exactly located in the position of the thumb if a portable information processor is held with the left hand as the cylindrical or tabular joy stick 92 which falls on an XY direction as a pointing device is shown in drawing 9 which shall be provided in an axis-of-rotation top or the neighborhood Operation of a pointing device is attained holding a portable information processor with the left thumb. It becomes possible to perform operation of a pointing device and operation of a character input simultaneously using a right hand since the character input is possible.

[0032] The position of the joy stick 92 is made into an almost symmetrical position (in drawing 9 it becomes right-hand side) and the same effect is acquired even if a pointing device is operated with the right hand and it performs a character input with the left hand.

[0033] Drawing 10 is a front view at the time of having a touch panel and the touch panel 93 is located in the front face of the liquid crystal display 3. Pointing operation is possible by inputting using the pen 94 with the right hand holding a portable information processor with the left hand.

[0034] Drawing 11 is a sectional view of the input device 101 in drawing 10 and the surface of the input device 101 becomes depressed into a wrap portion about the field switch 103 of the elastomer covering 102 and provides 104 while it is covered with the elastomer covering 102 without a joint. Although the pen 94 for exclusive use will perform operation of the touch panel 93 not only the touch panel 93 but the input device 101 equivalent to a keyboard may be operated with the touch pen 94 in this case. If the input device 101 is operated with the touch pen 94 as shown

in the sectional view of the input device of drawing 11 since [which was provided in the elastomer covering 102] it becomes depressed and is caught in 104 the mistake of an input will not produce a nib easily.

[0035]

[Effect of the Invention] As this invention was explained above at the time of storage it is constituted so that a display may be covered by an input device an input device is rotated at the time of use and in order to use it widening the effect taken below is done so.

- 1) At the time of storage it has the function in which the input device member which served as the indicator protects the surface of a liquid crystal display from a pressure or a shock. High shock resistance can especially be obtained by using raw materials such as an elastomer for the surface of an input device.
- 2) Since an input device becomes oblong at the time of use is operating in the case of a character input that it is easy to take the large pitch between keys decreases.
- 3) Since the input device and the main part are connected with the vertical axis of rotation opening and closing of an input device can be operated by the hand of holding a main part.
- 4) Prevent being in an energization condition at the time of disuse and exhausting a cell unnecessarily by detecting the angle of an input device and furthermore performing on-off control of a power supply.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

- [Drawing 1] (a) The front view in the state where the liquid crystal display in the 1 embodiment of this invention was closed
- (b) The front view in the state where the liquid crystal display in the 1 embodiment of this invention was opened
- [Drawing 2] The A-A sectional view in drawing 1 (a)
- [Drawing 3] The perspective view showing the state in the middle of opening and closing of a liquid crystal display
- [Drawing 4] The perspective view showing the state where the liquid crystal display is opened and used
- [Drawing 5] (a) The perspective view showing the structure for regulating an angle of rotation
- (b) The sectional view showing the structure for regulating an angle of rotation
- [Drawing 6] The perspective view showing other structures for regulating the angle of rotation
- [Drawing 7] The sectional view showing the structure of the input device in a second embodiment of this invention
- [Drawing 8] The sectional view showing the structure for detecting opening and closing of the liquid crystal display in a third embodiment of this invention

[Drawing 9]The front view at the time of equipping the input device in a fourth embodiment of this invention with a pointing device

[Drawing 10]The front view at the time of having a touch panel in a fourth embodiment of this invention

[Drawing 11]The sectional view showing the structure of the input device in a fourth embodiment of this invention

[Description of Notations]

17191and 101 Input device

2 and 72 Base unit

3 Liquid crystal display

4 Axis of rotation

7 Guide groove

8 Projection

9a9b hollow

75 and 103 Field switch

76 and 102 Elastomer covering

81 Magnet

82 Electromagnetic switch

92 Joy stick

93 Touch panel

104 Hollow (input device upper surface)
